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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/821,143	LI, SHAOLIN	
	Examiner	Art Unit	
	JAIME M. HOLLIDAY	2617	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 26 May 2009.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-46 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-46 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

Response to Arguments

Applicant's arguments filed May 26, 2009 have been fully considered but they are not persuasive.

Applicant basically argues that Jia et al. do not teach or disclose the limitations of the independent claims, in particular "wherein the baseband processor is capable of operating substantially simultaneously with the multi-antenna signal processing circuit." Examiner contends that this limitation was not previously presented in claim 30, further the Rudrapatna reference is incorporated to teach this limitation as discussed below.

Applicant further argues that the combination of the Jia, Rudrapatna and Walton references does not teach or suggest the elements of the independent claims. In particular, that Rudrapatna fails to teach or suggest “a multi-antenna signal processing circuit situated in a first access point and adapted to operate simultaneously with a first baseband processor, so that said first baseband processor handles transmissions in a first mode between said first access point and a second access point under a first channel transmission condition, and said multi-antenna signal processor handles data transmission in a second mode between said first access point and said second access point under a second channel transmission condition.

Examiner respectfully disagrees with Applicant’s position that the combination of Rudrapatna and Jia et al. would only lead to the modification of the antenna elements of Jia to operate simultaneously. Applicant’s claim recites first and second circuitry that operates an antenna in different modes “substantially simultaneously.” The circuitry of Rudrapatna (signal source/control circuit and switches) performs the claimed functions

by employing ***more than one mode simultaneously*** utilizing different self routing mechanisms (paragraphs 25, 28, 30).

Applicant also argues that the Walton reference does not teach or suggest receiving “M independent RF modulated input signals from said second access point when the second channel transmission mode exists between the first access point and said second access point; multi-antenna signal processing circuit operates selectively with the first baseband processor to demodulate RF signals received in a channel from a second access point.”

Examiner respectively disagrees, because the Walton reference discloses that different transmission modes are associated with a different number (M) of antennas and different spatial processing is utilized at the transmitter and receiver ends (access points), which reads on “M independent RF modulated input signals from said second access point when the second channel transmission mode exists between the first access point and said second access point.” Further, it is inherent that there is circuitry in access point to control the antennas, there when the signals are demodulated and processed, an element of circuitry is performing these function, which reads on "multi-antenna signal processing circuit operates selectively with the first baseband processor to demodulate RF signals received in a channel from a second access point.”

Applicant additionally argues that the secondary references fail to teach the claim elements discussed above. Examiner contends that the secondary references were incorporated to teach limitations of the depending claims, and not the above-mentioned limitations of the independent claims.

Therefore, in view of the preceding arguments, Examiner maintains previous prior art rejections.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

1. **Claims 1-5, 8 and 9** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jia et al. (US 7,103,325 B1)** in view of **Rudrapatna (US 2002/0132600 A1)**, and in further view of **Walton et al. (US 2004/0082356 A1)**.

Consider **claim 1**, Jia et al. clearly show and disclose first mode and second mode (a space-time encoding mode is selected to use when transmitting with spatial diversity based on the receive diversity associated with a receiver device and the quality of the transmission channels based on information fed back from the receiver device; selectable space-time encoding modes are preferably space-time transmit diversity encoding and a version of BLAST-type encoding [col. 2 lines 33-40]); radio frequency (RF) multi-antenna access point enhancement circuit comprising: a multi-antenna signal processing circuit situated in a first access point (base station generally includes a control system, a baseband processor, transmit circuitry, receive circuitry, multiple antennas, and a network interface [col. 3 line 67- col. 4 lines 6]) and adapted to: operate with a first baseband processor, so that said first baseband processor handles data

transmissions in a first mode between said first access point and a second access point under a first channel transmission condition, and said multi-antenna signal processor handles data transmissions in a second mode between said first access point and said second access point under a second channel transmission condition (receive circuitry receives radio frequency signals through antennas bearing information from one or more remote transmitters provided by mobile terminals. The baseband processor processes the digitized received signal to extract the information or data bits conveyed in the received signal. The multiple antennas and the replicated transmit and receive circuitries provide spatial diversity [col. 3 line 67- col. 4 lines 6, 14-18, and 37-39]).

However, Jia et al. fail to specifically disclose that the two modes are operating simultaneously.

In the same field of endeavor, Rudrapatna clearly shows and discloses a multi-antenna signal processing circuit situated in a first access point and adapted to: operate simultaneously with a first baseband processor (an antenna array comprises circuitry coupled to the antenna groups to select and activate certain antennas in a group to enable the antenna array to operate in either a beam forming/steering mode, a diversity mode or a MIMO mode or any combination thereof; self routing mechanisms (e.g., code division) to route specific signals to one specific set of antennas (to employ one mode) while simultaneously route another set of signals to another set of antennas (to employ another mode) [paragraphs 25, 28, 30]); first baseband processor handles data

transmissions in a first mode between said first access point and a second access point under a first channel transmission condition, and said multi-antenna signal processor handles data transmissions in a second mode between said first access point and said second access point under a second channel transmission condition (first group can also be configured to perform MIMO operations such as BLAST or perform diversity operations by selecting and activating orthogonally polarized antennas from the antenna pairs. Signal source/control circuit **128** along with the switches (120, 122, 124 and 126) can be designed to route signals appearing on paths 130, 132, 134 and 136 to be automatically routed to certain antennas based on characteristics of the signals so that any group in the antenna array can operate in either of the three modes [abstract, paragraphs 25, 28, 30]).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to select a mode based on the characteristics of received and transmitted signals as taught by Rudrapatna in the system of Jia et al., in order to optimize communication efficiency between communicating devices over varying channel conditions (Jia et al.; col. 2 lines 25-30).

However, Jia et al., as modified by Rudrapatna, fail to specifically disclose that that input signals are modulated using the channel matrix and received RF signals are demodulated.

In the same field of endeavor, Walton et al. clearly show and disclose receive M independent RF modulated input signals from said second access

point when the second channel transmission mode exists between the first access point and said second access point (Different transmission modes may also be used, depending on the number of antennas at the user terminals and the channel conditions. Each transmission mode is associated with different spatial processing at the transmitter and receiver and may be selected for use under different operating conditions [paragraph 13]); wherein said multi-antenna signal processing circuit operates selectively with a first baseband processor to demodulate RF signals received in a channel from a second access point (At access point **110**, the transmitted uplink signal(s) are received by antennas **724**, demodulated by demodulators **722**, and processed by an RX spatial processor **740** and an RX data processor **742** [paragraph 218]); process said M independent RF modulated input signals using a channel mixing matrix to extract N independent data signals transmitted by said second access point (access point can form the channel response matrix for the N_{ap} selected user terminals and perform QR factorization on H_{mu}. The access point then precodes the N_{ap} data symbol streams with the matrix to obtain N_{ap} precoded symbol streams a, and further processes the precoded symbol streams with the unitary matrix to obtain the N_{ap} transmit symbol streams for transmission to the N_{ap} user terminals [paragraph 327]).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made use a channel matrix to process received and transmitted signals as taught by Walton et al. in the system of Jia et al., as

modified by Rudrapatna, in order to obtain high throughput to multiple users (Walton et al.; paragraph 11).

Consider **claim 2**, the combination of Jia et al. and Rudrapatna, as modified by Walton et al., clearly shows and discloses the claimed invention **as applied to claim 1 above**, and in addition, Walton et al. further disclose that a page message may be used to page multiple user terminals and is sent using FCH PDU Type 0. Page PDUs are transmitted using the diversity mode and the lowest rate of 0.25 bps/Hz to increase the likelihood of correct reception by the user terminals. A broadcast message may be used to send information to multiple user terminals and is sent using FCH PDU Type 0. The Broadcast PDUs are also transmitted using the diversity mode and the lowest rate of 0.25 bps/Hz to increase the likelihood of correct reception. A user packet may be used to send user-specific data, and may be sent using FCH PDU Type 1 or 2. User PDUs of Type 1 and 2 are sent on the FCH following any Page and Broadcast PDUs sent on the FCH. Each User PDU may be transmitted using the diversity, beam-steering, or spatial multiplexing mode, reading on the claimed "multi-antenna signal processing circuit is enabled and selectively operates in said second mode when channel conditions indicate that a data rate in said channel has fallen below a predetermined threshold," (paragraphs 160-162).

Consider **claim 3**, the combination of Jia et al. and Rudrapatna, as modified by Walton et al., clearly shows and discloses the claimed invention **as applied to claim 1 above**, and in addition, Walton et al. further disclose that

when scheduled for uplink transmission, the user terminal transmits an RCH PDU that includes the reference, which is used by the access point to determine the maximum rate on the uplink. The scheduler then uses the maximum rates that the uplink can support for each active user terminal to schedule uplink data transmission in subsequent TDD frames. The rates and other channel assignment information for the user terminal are reflected in an information element sent on the FCCH, reading on the claimed "multi-antenna signal processing circuit is enabled and selectively operates in said second mode in response to a determination that a data rate in said channel is to be enhanced above a nominal operating rate," (paragraph 676).

Consider **claim 4**, the combination of Jia et al. and Rudrapatna, as modified by Walton et al., clearly shows and discloses the claimed invention **as applied to claim 1 above**, and in addition, Walton et al. further disclose that frequency selective fading can be conveniently combated with OFDM by repeating a portion of (or appending a cyclic prefix to) each transformed symbol to form a corresponding OFDM symbol, which is then transmitted. For the uplink in the multi-user spatial multiplexing mode, the access point can recover N_{ap} symbol streams transmitted simultaneously by N_{ap} user terminals using MMSE receiver processing, successive interference cancellation, or some other receiver processing technique. The uplink transmissions from the user terminals should be approximately time-aligned at the access point (e.g., time-aligned to within the cyclic prefix), reading on the claimed "multi-antenna signal processing circuit is

enabled and selectively operates in said second mode in response to a determination that frequency selective fading is present in said channel," (paragraphs 67, 328).

Consider **claim 5**, the combination of Jia et al. and Rudrapatna, as modified by Walton et al., clearly shows and discloses clearly show and disclose the claimed invention **as applied to claim 1 above**, and in addition, Jia et al. further disclose that a space-time encoding mode is selected to use when transmitting with spatial diversity based on the receive diversity associated with a receiver device and the quality of the transmission channels based on information fed back from the receiver device. The selectable space-time encoding modes are preferably space-time transmit diversity encoding and a version of BLAST-type encoding, reading on the claimed "multi-antenna signal processing circuit is adapted to monitor channel transmission conditions," (col. 2 lines 33-40). The base station generally includes a control system, a baseband processor, transmit circuitry, receive circuitry, multiple antennas, reading on the claimed "multi-antenna signal processing circuit is situated in a signal path ahead of said first baseband processor," (fig. 2, col. 3 line 67- col. 4 lines 3).

Consider **claim 8**, the combination of Jia et al. and Rudrapatna, as modified by Walton et al., clearly shows and discloses the claimed invention **as applied to claim 1 above**, and in addition, Jia et al. further disclose that spatial diversity is typically a function of the number and placement of transmit and receive antennas relative to a transmitter and receiver. Systems employing

spatial diversity with multiple transmit and receive antennas are generally referred to as multiple-input multiple-output (MIMO) systems, reading on the claimed " multi-antenna signal processing circuit is configured as a multiple-in, multiple out (MIMO) processor," (col. 1 lines 20-25), wherein the terminals have multiple antennas and process multiple signals.

Consider **claim 9**, the combination of Jia et al. and Rudrapatna, as modified by Walton et al., clearly shows and discloses the claimed invention **as applied to claim 1 above**, and in addition, Walton et al. further disclose that for a given pairing of multi-antenna access point and multi-antenna user terminal, a MIMO channel is formed by the transmit antennas and receive antennas available for use for data transmission. Different MIMO channels are formed between the access point and different multi-antenna user terminals. Each MIMO channel may be decomposed into spatial channels. N_s data streams may be transmitted on the N_s spatial channels, reading on the claimed "multi-antenna signal processing circuit demodulates a data stream transmitted using multiple independent antennas which each transmit a portion of said data stream," (paragraph 53).

2. **Claims 6, 10, 17 and 18** are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Jia et al. (US 7,103,325 B1)** and **Rudrapatna (US 2002/0132600 A1)**, in view of **Walton et al. (US 2004/0082356 A1)**, and in further view of **Bjorklund et al. (US 7,126,926 B1)**.

Consider **claim 6**, and **as applied to claim 1 above**, the combination of Jia et al. and Rudrapatna, as modified by Walton et al., clearly shows and discloses the claimed invention except that the signals are 802.11 compatible.

In the same field of endeavor, Bjorklund et al. clearly show and disclose a device and system capable of communication using the RadPad network and the IEEE 802.11 protocol at the same time. A wired LAN is also connected to an IEEE 802.11 access point **1507**, which may utilize the Spectrum 24 network. A multiple use device **1515** containing a RadPad antenna **1590** and a IEEE 802.11 antenna **1508** as well as ports for data/fax communication, infrared tO communication, communication using the RS-232 protocol, modem communication and printer communication is provided in the system. The multiple use device also uses the IEEE 802.11 antenna 1508 to communicate in a high speed, long range manner with the access point 1507 to access services on the wired LAN, which may include the use of the Internet for data and voice-over IP, reading on the claimed "first baseband processor is compatible with an 802.11x communications protocol; multi-antenna signal processor is compatible with an IEEE 802.11 type standard," (col. 18 line 53- col. 19 line 9).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to communicate using the IEEE 802.11 standard as taught by Bjorklund et al. in the system of Jia et al. and Rudrapatna, as modified by Walton et al., in order to communicate with multiple users using different applications (Bjorklund et al.; abstract).

Consider **claim 10**, Jia et al. clearly show and disclose first mode and second mode (a space-time encoding mode is selected to use when transmitting with spatial diversity based on the receive diversity associated with a receiver device and the quality of the transmission channels based on information fed back from the receiver device; selectable space-time encoding modes are preferably space-time transmit diversity encoding and a version of BLAST-type encoding [col. 2 lines 33-40]); radio frequency (RF) multi-antenna access point enhancement circuit comprising: a multi-antenna signal processing circuit situated in a first access point (base station generally includes a control system, a baseband processor, transmit circuitry, receive circuitry, multiple antennas, and a network interface [col. 3 line 67- col. 4 lines 6]); and adapted to: first baseband processor handles data transmissions in a first mode between said first access point, and a second access point under a first channel transmission condition, and said multi-antenna signal processor handles data transmissions in a second mode between said first access point and said second access point under a second channel transmission condition; wherein said multi-antenna signal processing circuit operates with a first baseband processor to receive and transmit RF signals in a channel between said first access point and said second access point (receive circuitry receives radio frequency signals through antennas bearing information from one or more remote transmitters provided by mobile terminals. The baseband processor processes the digitized received signal to extract the information or data bits conveyed in the received signal. The multiple

antennas and the replicated transmit and receive circuitries provide spatial diversity [col. 3 line 67- col. 4 lines 6, 14-18, and 37-39]).

However, Jia et al. fail to specifically disclose that the two modes are operating simultaneously.

In the same field of endeavor, Rudrapatna clearly shows and discloses a multi-antenna signal processing circuit situated in a first access point and adapted to: operate simultaneously with a first baseband processor (an antenna array comprises circuitry coupled to the antenna groups to select and activate certain antennas in a group to enable the antenna array to operate in either a beam forming/steering mode, a diversity mode or a MIMO mode or any combination thereof; self routing mechanisms (e.g., code division) to route specific signals to one specific set of antennas (to employ one mode) while simultaneously route another set of signals to another set of antennas (to employ another mode) [paragraphs 25, 28, 30]); first baseband processor handles data transmissions in a first mode between said first access point and a second access point under a first channel transmission condition, and said multi-antenna signal processor handles data transmissions in a second mode between said first access point and said second access point under a second channel transmission condition (first group can also be configured to perform MIMO operations such as BLAST or perform diversity operations by selecting and activating orthogonally polarized antennas from the antenna pairs. Signal source/control circuit **128** along with the switches (120, 122, 124 and 126) can be designed to route signals

appearing on paths 130, 132, 134 and 136 to be automatically routed to certain antennas based on characteristics of the signals so that any group in the antenna array can operate in either of the three modes [abstract, paragraphs 25, 28, 30]).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to select a mode based on the characteristics of received and transmitted signals as taught by Rudrapatna in the system of Jia et al., in order to optimize communication efficiency between communicating devices over varying channel conditions (Jia et al.; col. 2 lines 25-30).

However, Jia et al., as modified by Rudrapatna, fail to specifically disclose that that input signals are modulated using the channel matrix and received RF signals are demodulated.

In the same field of endeavor, Walton et al. clearly show and disclose receive M independent RF modulated input signals from said second access point when the second channel transmission mode exists between the first access point and said second access point (different transmission modes may also be used, depending on the number of antennas at the user terminals and the channel conditions. Each transmission mode is associated with different spatial processing at the transmitter and receiver and may be selected for use under different operating conditions [paragraph 13]); process said M independent RF modulated input signals using a channel mixing matrix to extract N independent data signals transmitted by said second access point (access point

can form the channel response matrix for the N_{ap} selected user terminals and perform QR factorization on H_{mu}. The access point then precodes the N_{ap} data symbol streams with the matrix to obtain N_{ap} precoded symbol streams a, and further processes the precoded symbol streams with the unitary matrix to obtain the N_{ap} transmit symbol streams for transmission to the N_{ap} user terminal [paragraph 327]); transmit an RF modulated signal to said second access point using a point coordination function (PCF) mode so as to maintain timing compatibility (downlink beacon pilot and MIMO pilot are sent on the BCH in each TDD frame. The beacon pilot may be used by the user terminals for timing and frequency acquisition and Doppler estimation [paragraph 543], *wherein the access point sending beacon signals reads on the point coordinator functionality*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made use a channel matrix to process received and transmitted signals as taught by Walton et al. in the system of Jia et al., in order to obtain high throughput to multiple users (Walton et al.; paragraph 11).

However, Jia et al., as modified by Walton et al., fail to specifically disclose that the signals are 802.11 compatible.

In the same field of endeavor, Bjorklund et al. clearly show and disclose 802.11x compatible RF multi-antenna access point; 802.11x protocol (multiple use device also uses the IEEE 802.11 antenna 1508 to communicate in a high speed, long range manner with the access point 1507 to access services on the

wired LAN, which may include the use of the Internet for data and voice-over IP [col. 18 line 53- col. 19 line 9]).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to communicate using the IEEE 802.11 standard as taught by Bjorklund et al. in the system of Jia et al., as modified by Walton et al., in order to communicate with multiple users using different applications (Bjorklund et al.; abstract).

Consider **claim 17**, the combination of Jia et al. and Rudrapatna, as modified by Walton et al. and Bjorklund et al., clearly show and disclose the claimed invention **as applied to claim 10 above**, and in addition, Walton et al. further disclose that data transmission on one wideband eigenmode may be achieved using either beam-forming or beam-steering, reading on the claimed "multi-antenna signal processing circuit uses a wave beam transmission to communicate selectively to a target in a specific location, and not to other targets," (fig. 1, paragraph 509).

Consider **claim 18**, the combination of Jia et al. and Rudrapatna, as modified by Walton et al. and Bjorklund et al., clearly show and disclose the claimed invention **as applied to claim 10 above**, and in addition, Bjorklund et al. further video security cameras to be placed anywhere without wiring, in places such as hotels, hospitals, schools, banks, retail and convenience stores, private homes and businesses. Security system comprises a wired LAN, a host, video monitor(s), a first tier base station, a second tier base station and video cameras.

Video camera includes a wireless communication module for communication with first-tier base station, reading on the claimed "multi-antenna signal processing circuit is incorporated as part of a closed circuit television monitoring system, and said M independent signals are transmitted by N individual cameras," (fig. 6, col. 8 lines 20-45).

3. **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over **J** the combination of **Jia et al. (US 7,103,325 B1)** and **Rudrapatna (US 2002/0132600 A1)** in view of **Walton et al. (US 2004/0082356 A1)**, and in further view of **Gopalakrishnan et al. (US 7,006,464 B1)**.

Consider **claim 7**, and **as applied to claim 1 above**, the combination of Jia et al. and Rudrapatna, as modified by Walton et al., clearly show and disclose the claimed invention except that processing latency is compensated by dummy data.

In the same field of endeavor, Gopalakrishnan et al. clearly show and disclose an uplink and downlink channel structure supports a shared downlink data channel. The new structure accommodates advanced physical and Medium Access Control (MAC) layer techniques, such as incremental redundancy (IR), fast adaptation to channel conditions, and multiple input multiple output (MIMO) antenna configuration (abstract). The HS-DSCH uses multi-code transmission using the available channelization code space. In this channel, traffic data and a preamble, per TTI, are time multiplexed within the downlink shared channel

frame. The use of preamble, reading on the claimed "dummy data," within the HS-DSCH TTIs alleviates the use of additional code-multiplexed channels that will have to carry the various control fields. The preamble solution preserves the OVSF code space, and reduces decoding latencies. The preamble is of variable length depending on the UL DPCCH RI field decoding, reading on the claimed "processing latency of said multi-antenna signal processing circuit is compensated using a dummy data response to maintain compatibility with a transmission protocol used by said first access point and said second access point," (col. 5 line 60- col. 6 line 10).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to transmit a preamble within a downlink transmission as taught by Gopalakrishnan et al. in the system of Jia et al. and Rudrapatna, as modified by Walton et al., in order to use OVSF code space more efficiently (Gopalakrishnan et al.; abstract).

4. **Claims 11-13** are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Jia et al. (US 7,103,325 B1)**, **Rudrapatna (US 2002/0132600 A1)** and **Walton et al. (US 2004/0082356 A1)**, in view of **Bjorklund et al. (US 7,126,926 B1)**, and in further view of **Terry (US 7,046,651 B2)**.

Consider **claim 11**, and **as applied to claim 10 above**, the combination of Jia et al. and Rudrapatna, as modified by Walton et al. and Bjorklund et al.,

clearly show and disclose the claimed invention except that a HR/DSSS physical layer frame structure is used.

In the same field of endeavor, Terry clearly shows and discloses the 802.11 standard, wherein the PHY layer provides protocol for the hardware of WLANs termed stations or nodes. A station may be mobile station, wireless enabled laptop or desktop personal computer, and the like. The PHY layer concerns transmission of data between those stations, and there are currently four different types of PHY layers: direct sequence spread spectrum (DSSS) **22**, frequency-hopping spread spectrum (FHSS) **23**, infrared (IR) pulse modulation **24**, and orthogonal frequency-division multiplexing (OFDM). The MAC layer is a set of protocols that maintain order in the use of the shared bandwidth or medium, and the 802.11 standard specifies two modes of communication: a compulsory Distributed Coordination Function (DCF), and an optional Point Coordination Function (PCF), reading on the claimed "high rate direct sequence spread spectrum (HR/DSSS) physical layer frame structure," (col. 1 lines 34-49). Because a single MAC layer must interface with disparate PHY layers, the 802.11 standard uses an additional protocol layer termed the Physical Layer Convergence Protocol (PLCP) disposed between them that is defined differently for each transmission method. The PLCP adds a preamble and a header (each of various sizes) to a PLCP Service Data Unit (PSDU), which is the portion of the complete transmission frame (PPDU or PLCP Protocol Data Unit at the PHY layer) that carries the actual data to be transmitted between stations or between

the point controller PC and a station, reading on the claimed “frame structure that has a preamble and header compatible with said 802.11x protocol,” (col. 13 lines 50-60).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to implement a DSSS frame structure in a 802.11 environment as taught by Terry in the system of Jia et al. and Rudrapatna, as modified by Walton et al. and Bjorklund et al., in order to use multiple layers to communicate between nodes and terminal.

Consider **claim 12**, the combination of Jia et al., Rudrapatna and Walton et al., as modified by Bjorklund et al. and Terry, clearly shows and discloses the claimed invention **as applied to claim 11 above**, and in addition, Walton et al. further disclose that the RCH Message Type, RCH Message Length, and FCH Rate Indicator fields are sent in the header of the first PHY frame of the RCH PDU. The FCH Rate Indicator field is used to convey FCH rate information (e.g., the maximum rates supported by each of the spatial channels) to the access point, reading on the claimed “header includes additional data to identify a high rate mode,” (paragraph 176).

Consider **claim 13**, the combination of Jia et al., Rudrapatna and Walton et al., as modified by Bjorklund et al. and Terry, clearly shows and discloses the claimed invention **as applied to claim 11 above**, and in addition, Walton et al. further disclose that the specific rate used for each RACH message is indicated by a 2-bit RACH data rate indicator (DRI), which is embedded in the preamble

portion of the RACH PDU. The size of each RACH message is indicated by a Message Duration field included in the RACH message. **Table 15** lists the four RACH rates, their associated coding and modulation parameters, and the message sizes supported by these RACH rates, reading on the claimed "header includes additional data to identify a modulation format," (paragraph 147).

5. **Claims 14-16 and 19** are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Jia et al. (US 7,103,325 B1)**, **Rudrapatna (US 2002/0132600 A1)** and **Walton et al. (US 2004/0082356 A1)**, in view of **Bjorklund et al. (US 7,126,926 B1)**, and in further view of **Sugar et al. (US 2004/0219937 A1)**.

Consider **claims 14 and 15**, and **as applied to claim 10 above**, the combination of Jia et al. and Rudrapatna, as modified by Walton et al. and Bjorklund et al., clearly show and disclose the claimed invention except multicasting data to different targets at different ranges.

In the same field of endeavor, Sugar et al. clearly show and disclose that a device, such as the AP **110**, may have different range modes, including a range-enhanced mode. For example, a network administrator may program this mode at the AP whenever range is to be extended beyond that of a single (omnidirectional) transmit (Tx) antenna for multicast signals. The AP may be configured to operate in directed range-enhanced mode, such as CBF mode where a signal (packet, etc.) is transmitted through all four antennas simultaneously with corresponding transmit antenna weights, reading on the

claimed “second range; second access period.” Alternatively, the AP may be configured to operate in the omnidirectional mode (omni-mode) where a packet is transmitted through one of four antennas at the same total output power as CBF mode, reading on the claimed “first range; first access period,” (paragraph 30). The terminal comprises at least two antennas, though four antennas (AP). An RF section is coupled to the antennas, and includes a transmitter (Tx) and a receiver (Rx). A baseband section is coupled to the RF section. The baseband section multiplies the signal to be transmitted by corresponding transmit antenna weights and likewise multiplies signals received at each of the antennas by corresponding receive antenna weights and combines the resulting signals to recover the received signal therefrom. When it is stated hereinafter that a communication device transmits a signal to another communication using "CBF", this means that the transmitting communication device multiplies the signal by transmit antenna weights (corresponding to the plurality of antennas of the transmitting communication device) corresponding to a destination device, that optimize reception of the signal at the destination device. When transmitting a signal through a single antenna, the baseband section multiplies the signal with a transmit weight vector that weights one antenna and nulls all of the other antennas, reading on the claimed “first baseband processor sends multicast transmissions to a first set of targets within a first range of said first access point, and said multi-antenna signal processing circuit sends multicast transmissions to a second set of targets within a second range of said first access point; first

baseband processor communicates with a first set of targets during a first access period, and said multi-antenna signal processing circuit communicates with a second set of targets during a second access period," (paragraphs 33, 34).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to implement multiple modes to transmit multicast signals as taught by Sugar et al. in the system of Jia et al. and Rudrapatna, as modified by Walton et al. and Bjorklund et al., in order to enhance the multicast range of an access point.

Consider **claim 16**, the combination of Jia et al., Rudrapatna and Walton et al., as modified by Bjorklund et al. and Sugar et al., clearly show and disclose the claimed invention **as applied to claim 15 above**, and in addition, Sugar et al. further disclose that a network administrator may program this mode at the AP whenever range is to be extended beyond that of a single (omnidirectional) transmit (Tx) antenna for multicast signals, reading on the claimed "first access period and said second access period are alternated at a predetermined ratio," (paragraphs 33, 34), wherein the network administrator programming the mode defines the predetermined ratio.

Consider **claim 19**, and **as applied to claim 10 above**, the combination of Jia et al. and Rudrapatna, as modified by Walton et al. and Bjorklund et al., clearly show and disclose the claimed invention except that antennas can be selectively added.

In the same field of endeavor, Sugar et al. clearly show and disclose that a device, such as the AP **110**, may have different range modes, including a range-enhanced mode. For example, a network administrator may program this mode at the AP whenever range is to be extended beyond that of a single (omnidirectional) transmit (Tx) antenna for multicast signals. The AP may be configured to operate in directed range-enhanced mode, such as CBF mode where a signal (packet, etc.) is transmitted through all four antennas simultaneously with corresponding transmit antenna weights. Alternatively, the AP may be configured to operate in the omnidirectional mode (omni-mode) where a packet is transmitted through one of four antennas at the same total output power as CBF mode, (paragraph 30). A multicast signal may be sent multiple times through each of a plurality of independent omnidirectional transmit antennas of a communication device to a plurality of other communication devices to improve packet error rate (PER) at a given range (i.e., SNR), reading on the claimed "receive sensitivity of said first access point can be improved by selectively adding additional multi-antenna signal processing circuit modules for a data transmission, and/or increasing M," (paragraphs 33, 34).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to transmit multicast signals through multiple antenna as taught by Sugar et al. in the system of Jia et al. and Rudrapatna et al., as modified by Walter et al. and Bjorklund et al., in order to enhance the multicast range of an access point.

6. **Claim 20** is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Jia et al. (US 7,103,325 B1)** and **Walton et al. (US 2004/0082356 A1)** in view of **Sugar et al. (US 2004/0219937 A1)**, and in further view of **Rudrapatna (US 2002/0132600 A1)**.

Consider **claim 20**, Jia et al. clearly show and disclose first operating mode and second operating mode (a space-time encoding mode is selected to use when transmitting with spatial diversity based on the receive diversity associated with a receiver device and the quality of the transmission channels based on information fed back from the receiver device; selectable space-time encoding modes are preferably space-time transmit diversity encoding and a version of BLAST-type encoding [col. 2 lines 33-40]); radio frequency (RF) multi-antenna access point circuit comprising a multi-antenna signal processing circuit (base station generally includes a control system, a baseband processor, transmit circuitry, receive circuitry, multiple antennas, and a network interface [col. 3 line 67- col. 4 lines 6]); a baseband processor circuit for handling data transmissions during a first operating mode in a channel between a first access point and a second access point; a multi-antenna signal processing circuit for handling data transmissions during a second operating mode in said channel; modulator/demodulator circuit coupled to an antenna assembly and said multi-antenna signal processing circuit and baseband processor circuit for extracting I/Q data samples from an RF modulated received signal (receive circuitry

receives radio frequency signals through antennas bearing information from one or more remote transmitters provided by mobile terminals. The baseband processor processes the digitized received signal to extract the information or data bits conveyed in the received signal. This processing typically comprises demodulation, decoding, and error correction operations. The multiple antennas and the replicated transmit and receive circuitries provide spatial diversity [fig. 2, fig. 5, col. 3 line 67- col. 4 lines 6, 14-18, and 37-39]).

However, Jia et al. fail to specifically disclose that that input signals are modulated using the channel matrix.

In the same field of endeavor, Walton et al. clearly show and disclose receive M independent RF modulated input signals from said second access point (different transmission modes may also be used, depending on the number of antennas at the user terminals and the channel conditions; At access point **110**, the transmitted uplink signal(s) are received by antennas **724**, demodulated by demodulators **722**, and processed by an RX spatial processor **740** and an RX data processor **742** (paragraphs 13, 218); process said M independent RF modulated input signals using a channel mixing matrix to extract N independent data signals transmitted by said second access point (access point can form the channel response matrix for the N_{ap} selected user terminals and perform QR factorization on H_{mu}. The access point then precodes the N_{ap} data symbol streams with the matrix to obtain N_{ap} precoded symbol streams a, and further processes the precoded symbol streams with the unitary matrix to obtain the N_{ap}

transmit symbol streams for transmission to the N_{ap} user terminals [paragraph 327]).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made use a channel matrix to process received and transmitted signals as taught by Walton et al. in the system of Jia et al., in order to obtain high throughput to multiple users (Walton et al.; paragraph 11).

However, Jia et al., as modified by Walton et al., fail to specifically disclose that the multi-antenna circuitry and baseband processors are interfaced to a host computing system.

In the same field of endeavor, Sugar et al. clearly show and disclose a media access controller coupled to said multi-antenna signal processing circuit and baseband processor circuit for interfacing to a host computing system (baseband section is coupled to a host processor. The processing steps to be performed by a host processor **232** (in a host) by executing instructions stored in (or encoded on) a processor readable memory. An AP transmits a multicast data signal to multiple (or all) STAs, wherein the data unit is a media service data unit (MSDU) or a MAC protocol data unit (MPDU) according to IEEE 802.11x WLAN protocol [paragraphs 5, 33, 36] *wherein it is obvious that the access point comprises MAC circuitry or components to transmit MAC data units*].

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a host to process signals as taught

by Sugar et al. in the system of Jia et al., as modified by Walton et al., in order to obtain high throughput to multiple users (Walton et al.; paragraph 11).

However, the combination of Jia et al. and Walton et al., as modified by Sugar et al., fails to specifically disclose that the two modes are operating simultaneously.

In the same field of endeavor, Rudrapatna clearly shows and discloses the baseband processor is capable of operating substantially simultaneously with the multi-antenna signal processing circuit (an antenna array comprises circuitry coupled to the antenna groups to select and activate certain antennas in a group to enable the antenna array to operate in either a beam forming/steering mode, a diversity mode or a MIMO mode or any combination thereof; self routing mechanisms (e.g., code division) to route specific signals to one specific set of antennas (to employ one mode) while simultaneously route another set of signals to another set of antennas (to employ another mode) [paragraphs 25, 28, 30]).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to select a mode based on the characteristics of received and transmitted signals as taught by Rudrapatna in the system of Jia et al. and Walton et al., as modified by Sugar et al., in order to optimize communication efficiency between communicating devices over varying channel conditions (Jia et al.; col. 2 lines 25-30).

7. **Claims 21, 22, 25, 29, 30, 33-35, 38 and 42** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jia et al. (US 7,103,325 B1)** in view of **Rudrapatna (US 2002/0132600 A1)**.

Consider **claims 21 and 34**, Jia et al. clearly show and disclose first mode and second mode (a space-time encoding mode is selected to use when transmitting with spatial diversity based on the receive diversity associated with a receiver device and the quality of the transmission channels based on information fed back from the receiver device; selectable space-time encoding modes are preferably space-time transmit diversity encoding and a version of BLAST-type encoding [col. 2 lines 33-40]); An apparatus (communication system) comprising: a multi-antenna signal processing circuit (base station generally includes a control system, a baseband processor, transmit circuitry, receive circuitry, multiple antennas, and a network interface [col. 3 line 67- col. 4 lines 6]); a baseband processor capable of operating with the multi-antenna signal processing circuit, the first baseband processor capable of handling data transmissions in a first mode; and the multi-antenna signal processor capable Of handling data transmissions in a second mode (the receive circuitry receives radio frequency signals through antennas bearing information from one or more remote transmitters provided by mobile terminals. The baseband processor processes the digitized received signal to extract the information or data bits conveyed in the received signal. The multiple antennas and the replicated

transmit and receive circuitries provide spatial diversity [col. 3 line 67- col. 4 lines 6, 14-18, and 37-39]).

However, Jia et al. fail to specifically disclose that the two modes are operating simultaneously.

In the same field of endeavor, Rudrapatna clearly shows and discloses a baseband processor capable of operating substantially simultaneously with the multi-antenna signal processing circuit (an antenna array comprises circuitry coupled to the antenna groups to select and activate certain antennas in a group to enable the antenna array to operate in either a beam forming/steering mode, a diversity mode or a MIMO mode or any combination thereof; self routing mechanisms (e.g., code division) to route specific signals to one specific set of antennas (to employ one mode) while simultaneously route another set of signals to another set of antennas (to employ another mode)) [paragraphs 25, 28, 30]);

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to select a mode based on the characteristics of received and transmitted signals as taught by Rudrapatna in the system of Jia et al., in order to optimize communication efficiency between communicating devices over varying channel conditions (Jia et al.; col. 2 lines 25-30).

Consider **claim 22**, Jia et al., as modified by Rudrapatna, clearly show and disclose the claimed invention **as applied to claim 21 above**, and in addition, Jia et al. further discloses that a base station controller controls wireless

communications within multiple cells which are served by corresponding base stations. The base station, reading on the claimed "first and second access points," generally includes a control system, a baseband processor, transmit circuitry, receive circuitry, multiple antennas and a network interface. The receive circuitry receives radio frequency signals through antennas bearing information from one or more remote transmitters provided by mobile terminals. The baseband processor processes the digitized received signal to extract the information or data bits conveyed in the received signal. The multiple antennas and the replicated transmit and receive circuitries provide spatial diversity, (col. 3 lines 50-55, 67- col. 4 lines 6, 14-18, and 37-39). The selectable space-time encoding modes are preferably space-time transmit diversity encoding and a version of BLAST-type encoding, reading on the claimed "a first access point capable of transmitting and receiving data in a first mode or a second mode, or combinations thereof; a second access point capable of transmitting or receiving data in a first mode or a second mode, or combinations thereof; the first baseband processor further capable of handling data transmissions in a first mode between said first access point and a second access point under a first channel transmission condition; and the multi-antenna signal processor further capable of handling data transmissions in a second mode between said first access point and said second access point under a second channel transmission condition," (fig. 1, col. 2 lines 33-40).

Consider **claims 25 and 38**, Jia et al., as modified by Rudrapatna, clearly show and disclose the claimed invention **as applied to claims 21 and 35 above**, respectively, and in addition, Jia et al. further discloses that the receive circuitry receives radio frequency signals through antennas bearing information from one or more remote transmitters provided by mobile terminals. The baseband processor processes the digitized received signal to extract the information or data bits conveyed in the received signal. This processing typically comprises demodulation, decoding, and error correction operations, reading on the claimed "the multi-antenna signal processor is further capable of operating selectively with a first baseband processor to demodulate signals received in a channel from a second access point," (fig. 2, fig. 5, col. 3 line 67- col. 4 lines 6, 14-18, and 37-39).

Consider **claims 29 and 42**, Jia et al., as modified by Rudrapatna, clearly show and disclose the claimed invention **as applied to claims 21 and 34 above**, respectively, and in addition, Jia et al. further discloses that the base station, reading on the claimed "access point," generally includes a control system, a baseband processor, transmit circuitry, receive circuitry, multiple antennas, reading on the claimed "multi-antenna signal processing unit," and a network interface. The receive circuitry receives radio frequency signals through antennas bearing information from one or more remote transmitters provided by mobile terminals. The baseband processor processes the digitized received signal to extract the information or data bits conveyed in the received signal. The

multiple antennas and the replicated transmit and receive circuitries provide spatial diversity, reading on the claimed "multi-antenna signal processor is capable of operating with said baseband processor to receive or transmit signals in a channel between said first access point and said second access point," (col. 3 line 67- col. 4 lines 6, 14-18, and 37-39).

Consider **claim 30**, Jia et al. clearly show and disclose first mode and second mode (a space-time encoding mode is selected to use when transmitting with spatial diversity based on the receive diversity associated with a receiver device and the quality of the transmission channels based on information fed back from the receiver device; selectable space-time encoding modes are preferably space-time transmit diversity encoding and a version of BLAST-type encoding [col. 2 lines 33-40]); a multi-antenna access point circuit (base station generally includes a control system, a baseband processor, transmit circuitry, receive circuitry, multiple antennas, and a network interface [col. 3 line 67- col. 4 lines 6]); comprising: a baseband processor circuit capable of handling data transmissions during a first operating mode in a channel between a first access point and a second access point; and a multi-antenna signal processing circuit capable of handling data transmissions during a second operating mode in said channel (receive circuitry receives radio frequency signals through antennas bearing information from one or more remote transmitters provided by mobile terminals. The baseband processor processes the digitized received signal to extract the information or data bits conveyed in the received signal. The multiple

antennas and the replicated transmit and receive circuitries provide spatial diversity [col. 3 line 67- col. 4 lines 6, 14-18, and 37-39]).

However, Jia et al. fail to specifically disclose that the two modes are operating simultaneously.

In the same field of endeavor, Rudrapatna clearly shows and discloses a baseband processor capable of operating substantially simultaneously with the multi-antenna signal processing circuit (an antenna array comprises circuitry coupled to the antenna groups to select and activate certain antennas in a group to enable the antenna array to operate in either a beam forming/steering mode, a diversity mode or a MIMO mode or any combination thereof; self routing mechanisms (e.g., code division) to route specific signals to one specific set of antennas (to employ one mode) while simultaneously route another set of signals to another set of antennas (to employ another mode)) [paragraphs 25, 28, 30]);

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to select a mode based on the characteristics of received and transmitted signals as taught by Rudrapatna in the system of Jia et al., in order to optimize communication efficiency between communicating devices over varying channel conditions (Jia et al.; col. 2 lines 25-30).

Consider **claim 33**, Jia et al., as modified by Rudrapatna, clearly show and disclose the claimed invention **as applied to claim 30 above**, and in addition, Jia et al. further disclose that a space-time encoding mode is selected

to use when transmitting with spatial diversity based on the receive diversity associated with a receiver device and the quality of the transmission channels based on information fed back from the receiver device. The selectable space-time encoding modes are preferably space-time transmit diversity encoding and a version of BLAST-type encoding, reading on the claimed “the first operating mode or the second operating mode are selected by the multi-antenna access point circuit,” (col. 2 lines 33-40).

Consider **claim 35**, Jia et al., as modified by Rudrapatna, clearly show and disclose the claimed invention **as applied to claim 34 above**, and in addition, Jia et al. further discloses that a base station controller controls wireless communications within multiple cells which are served by corresponding base stations. In general, each base station facilitates communications with mobile terminals, which are within the cell associated with the corresponding base station. The base station, reading on the claimed “first and second access points,” generally includes a control system, a baseband processor, transmit circuitry, receive circuitry, multiple antennas and a network interface. The receive circuitry receives radio frequency signals through antennas bearing information from one or more remote transmitters provided by mobile terminals. The baseband processor processes the digitized received signal to extract the information or data bits conveyed in the received signal. The multiple antennas and the replicated transmit and receive circuitries provide spatial diversity, (col. 3 lines 50-60, 67- col. 4 lines 6, 14-18, and 37-39). The selectable space-time

encoding modes are preferably space-time transmit diversity encoding and a version of BLAST-type encoding, reading on the claimed “a mobile terminal capable of transmitting data to a first and/or second access point; the first access point capable of transmitting and receiving data in a first and/or second mode; the second access point capable of transmitting and receiving data in a first and/or second mode; the first baseband processor further capable of handling data transmissions in a first mode between said first access point and a second access point under a first channel transmission condition; and the multi-antenna signal processor further capable of handling data transmissions in a second mode between said first access point and said second access point under a second channel transmission condition,” (fig. 1, col. 2 lines 33-40).

8. **Claims 23, 24, 31, 32, 36 and 37** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jia et al. (US 7,103,325 B1)** in view of **Rudrapatna (US 2002/0132600 A1)**, and in further view of **Walton et al. (US 2004/0082356 A1)**.

Consider **claims 23, 24, 31, 32, 36 and 37**, and **as applied to claims 22, 30, 35 above**, respectively, Jia et al., as modified by Rudrapatna, clearly show and disclose the claimed invention except that that input signals are modulated using the channel matrix.

In the same field of endeavor, Walton et al. clearly show and disclose that multiple rates and transmission modes are supported by the MIMO WLAN system to attain high throughput when supported by the channel conditions and

the capabilities of the user terminals. Different transmission modes may also be used, depending on the number of antennas at the user terminals and the channel conditions. Each transmission mode is associated with different spatial processing at the transmitter and receiver and may be selected for use under different operating conditions (paragraph 13). At access point **110**, the transmitted uplink signal(s) are received by antennas **724**, demodulated by demodulators **722**, and processed by an RX spatial processor **740** and an RX data processor **742**, reading on the claimed "the multi-antenna signal processor (multi-antenna signal processing circuit) is further capable of receiving M independent modulated input signals from the second access point if the second channel transmission condition exists between the first access point and the second access point," (paragraph 218). The access point precodes N_{ap} symbol streams to be sent to N_{ap} user terminals such that these symbol streams experience little cross-talk at the user terminals. The access point can form the channel response matrix for the N_{ap} selected user terminals and perform QR factorization on H_{mu}. The access point then precodes the N_{ap} data symbol streams with the matrix to obtain N_{ap} precoded symbol streams a, and further processes the precoded symbol streams with the unitary matrix to obtain the N_{ap} transmit symbol streams for transmission to the N_{ap} user terminals. Again, the access point can also transmit a steered reference to each user terminal, reading on the claimed "the multi-antenna signal processor (multi-antenna signal processing circuit) is further capable of processing the M independent modulated

input signals using a channel mixing matrix to extract N independent data signals transmitted by the second access point," (paragraph 327).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made use a channel matrix to process received and transmitted signals as taught by Walton et al. in the system of Jia et al., as modified by Rudrapatna, in order to obtain high throughput to multiple users (Walton et al.; paragraph 11).

9. **Claims 26, 27, 39 and 40** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jia et al. (US 7,103,325 B1)** in view of **Rudrapatna (US 2002/0132600 A1)**, and in further view of **Bjorklund et al. (US 7,126,926 B1)**.

Consider **claims 26, 27, 39 and 40**, and **as applied to claims 21, 22 and 35 above**, respectively, Jia et al., as modified by Rudrapatna, clearly show and disclose the claimed invention except that the signals are 802.11 compatible.

In the same field of endeavor, Bjorklund et al. clearly show and disclose a device and system capable of communication using the RadPad network and the IEEE 802.11 protocol at the same time. A wired LAN is also connected to an IEEE 802.11 access point **1507**, which may utilize the Spectrum 24 network. A multiple use device **1515** containing a RadPad antenna **1590** and a IEEE 802.11 antenna **1508** as well as ports for data/fax communication, infrared tO communication, communication using the RS-232 protocol, modem communication and printer communication is provided in the system. The

multiple use device also uses the IEEE 802.11 antenna 1508 to communicate in a high speed, long range manner with the access point 1507 to access services on the wired LAN, which may include the use of the Internet for data and voice-over IP, reading on the claimed "multi-antenna signal processor is compatible with an IEEE 802.11 type standard; the first baseband processor is further capable of handling data transmissions in a first mode between the first and second access points in accordance with an IEEE 802.11 type protocol and the multi-antenna signal processor is capable of handling data transmissions in a second mode between said first access point and said second access point in accordance with an IEEE 802.11 type protocol," (col. 18 line 53- col. 19 line 9).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to communicate using the IEEE 802.11 standard as taught by Bjorklund et al. in the system of Jia et al., as modified by Rudrapatna, in order to communicate with multiple users using different applications (Bjorklund et al.; abstract).

10. **Claims 28 and 41** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jia et al. (US 7,103,325 B1)** in view of **Rudrapatna (US 2002/0132600 A1)**, and in further view of **Terry (US 7,046,651 B2)**.

Consider **claims 28 and 41**, and **as applied to claim 22 and 35 above**, respectively, Jia et al., as modified by Rudrapatna, clearly show and disclose the claimed invention except that a PCF is used according to the 802.11 protocol.

In the same field of endeavor, Terry clearly shows and discloses the 802.11 standard, wherein the PHY layer provides protocol for the hardware of WLANs termed stations or nodes. A station may be mobile station, wireless enabled laptop or desktop personal computer, and the like. The PHY layer concerns transmission of data between those stations, and there are currently four different types of PHY layers: direct sequence spread spectrum (DSSS) **22**, frequency-hopping spread spectrum (FHSS) **23**, infrared (IR) pulse modulation **24**, and orthogonal frequency-division multiplexing (OFDM). The MAC layer is a set of protocols that maintain order in the use of the shared bandwidth or medium, and the 802.11 standard specifies two modes of communication: a compulsory Distributed Coordination Function (DCF), and an optional Point Coordination Function (PCF), reading on the claimed "the multi-antenna signal processor is further capable of transmitting an RF modulated signal to the second access point using a point coordination function (PCF) mode associated with an IEEE 802.11 type protocol," (col. 1 lines 34-49).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to implement a DSSS frame structure in a 802.11 environment as taught by Terry in the system of Jia et al., as modified by Rudrapatna, in order to use multiple layers to communicate between nodes and terminal.

11. **Claims 43 and 46** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jia et al. (US 7,103,325 B1)** in view of **Sugar et al. (US 2004/0219937 A1)**, and in further view of **Rudrapatna (US 2002/0132600 A1)**.

Consider **claim 43**, Jia et al. clearly show and disclose first operating mode and second operating mode; wherein said first operating mode and said second operating mode are automatically selected by the RF multi-antenna access point system based on a transmission condition in said channel (a space-time encoding mode is selected to use when transmitting with spatial diversity based on the receive diversity associated with a receiver device and the quality of the transmission channels based on information fed back from the receiver device. The selectable space-time encoding modes are preferably space-time transmit diversity encoding and a version of BLAST-type encoding [col. 2 lines 33-40]); communication system comprising: a baseband processor circuit, said baseband processor being capable of handling data transmissions during a first operating mode in a channel between the first access point and the second access point; and a multi-antenna signal processing circuit capable of handling data transmissions during a second operating mode in said channel (base station, includes a control system, a baseband processor, transmit circuitry, receive circuitry, multiple antennas, and a network interface. The receive circuitry receives radio frequency signals through antennas bearing information from one or more remote transmitters provided by mobile terminals. The baseband processor processes the digitized received signal to extract the

information or data bits conveyed in the received signal. This processing typically comprises demodulation, decoding, and error correction operations. The multiple antennas and the replicated transmit and receive circuitries provide spatial diversity [fig. 2, fig. 5, col. 3 line 67- col. 4 lines 6, 14-18, and 37-39]).

However, Jia et al. fail to specifically disclose that the baseband processors are coupled to a media access controller.

In the same field of endeavor, Sugar et al. clearly show and disclose a media access controller; a baseband processor circuit coupled to said media access controller (terminal comprises at least two antennas, though four antennas (AP).; A baseband section is coupled to the RF section. The baseband section is coupled to a host processor. The processing steps to be performed by a host processor **232** (in a host) by executing instructions stored in (or encoded on) a processor readable memory. An AP transmits a multicast data signal to multiple (or all) STAs, wherein the data unit is a media service data unit (MSDU) or a MAC protocol data unit (MPDU) according to IEEE 802.11x WLAN protocol [paragraphs 5, 33, 36] *wherein it is obvious that the access point comprises MAC circuitry or components to transmit MAC data units*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a host to process signals as taught by Sugar et al. in the system of Jia et al., in order to optimize signal communication.

However, Jia et al., as modified by Sugar et al., fail to specifically disclose that the two modes are operating simultaneously.

In the same field of endeavor, Rudrapatna clearly shows and discloses a baseband processor capable of operating substantially simultaneously with the multi-antenna signal processing circuit (an antenna array comprises circuitry coupled to the antenna groups to select and activate certain antennas in a group to enable the antenna array to operate in either a beam forming/steering mode, a diversity mode or a MIMO mode or any combination thereof; self routing mechanisms (e.g., code division) to route specific signals to one specific set of antennas (to employ one mode) while simultaneously route another set of signals to another set of antennas (to employ another mode)) [paragraphs 25, 28, 30]);

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to select a mode based on the characteristics of received and transmitted signals as taught by Rudrapatna in the system of Jia et al., as modified by Sugar et al., in order to optimize communication efficiency between communicating devices over varying channel conditions (Jia et al.; col. 2 lines 25-30).

Consider **claim 46**, the combination of Jia et al. and Sugar et al., as modified by Rudrapatna, clearly show and disclose the claimed invention **as applied to claim 43 above**, and in addition, Jia et al. further discloses that a space-time encoding mode is selected to use when transmitting with spatial diversity based on the receive diversity associated with a receiver device and the

quality of the transmission channels based on information fed back from the receiver device. The selectable space-time encoding modes are preferably space-time transmit diversity encoding and a version of BLAST-type encoding, reading on the claimed "the first operating mode or the second operating mode are selected by the multi-antenna access point circuit," (col. 2 lines 33-40).

12. **Claims 44 and 45** are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Jia et al. (US 7,103,325 B1)** and **Sugar et al. (US 2004/0219937 A1)**, in view of **Rudrapatna (US 2002/0132600 A1)**, and in further view of **Walton et al. (US 2004/0082356 A1)**.

Consider **claims 44 and 45**, and **as applied to claim 43 above**, the combination of Jia et al. and Sugar et al., as modified by Rudrapatna, clearly show and disclose the claimed invention except that that input signals are modulated using the channel matrix.

In the same field of endeavor, Walton et al. clearly show and disclose that multiple rates and transmission modes are supported by the MIMO WLAN system to attain high throughput when supported by the channel conditions and the capabilities of the user terminals. Different transmission modes may also be used, depending on the number of antennas at the user terminals and the channel conditions. Each transmission mode is associated with different spatial processing at the transmitter and receiver and may be selected for use under different operating conditions (paragraph 13). At access point **110**, the

transmitted uplink signal(s) are received by antennas **724**, demodulated by demodulators **722**, and processed by an RX spatial processor **740** and an RX data processor **742**, reading on the claimed "the multi-antenna signal processing circuit Is capable of receiving M independent modulated input signals from the second access point," (paragraph 218). The access point precodes N_{ap} symbol streams to be sent to N_{ap} user terminals such that these symbol streams experience little cross-talk at the user terminals. The access point can form the channel response matrix for the N_{ap} selected user terminals and perform QR factorization on H_{mu}. The access point then precodes the N_{ap} data symbol streams with the matrix to obtain N_{ap} precoded symbol streams a, and further processes the precoded symbol streams with the unitary matrix to obtain the N_{ap} transmit symbol streams for transmission to the N_{ap} user terminals. Again, the access point can also transmit a steered reference to each user terminal, reading on the claimed "the multi-antenna signal processing circuit is capable of processing the M independent modulated input signals using a channel mixing matrix to extract N independent data signals transmitted by the second access point," (paragraph 327).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made use a channel matrix to process received and transmitted signals as taught by Walton et al. in the system of Jia et al. and Sugar et al., as modified by Rudrapatna, in order to obtain high throughput to multiple users (Walton et al.; paragraph 11).

Conclusion

1. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAIME M. HOLLIDAY whose telephone number is (571)272-8618. The examiner can normally be reached on Monday through Friday 7:30am to 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles Appiah can be reached on (571) 272-7904. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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